DEFENSE ADVANCED RESEARCH PROJECTS AGENCY
Proposal Submission

DARPA's charter is to help maintain U.S. technological superiority over, and to prevent technological surprise by, its potential adversaries. Thus, the DARPA goal is to pursue as many highly imaginative and innovative research ideas and concepts with potential military and dual-use applicability as the budget and other factors will allow.

The topics published in this solicitation are broad in scope. They were developed to bring the small business community and research partners together to meet the technological needs of today. DARPA has identified 8 technical topics, numbered **DARPA ST99-001** through **DARPA ST99-008** to which small businesses may respond in the fiscal year (FY) 99 solicitation. Please note that these topics are UNCLASSIFIED and only UNCLASSIFIED proposals will be entertained. These are the only topics for which proposals will be accepted at this time. Full topic descriptions, which originated from DARPA technical offices, are included.

Please note that **5 copies** of each proposal must be mailed or hand-carried; DARPA will **not** accept proposal submissions by electronic facsimile (fax). A checklist has been prepared to assist small business activities in responding to DARPA topics. Please use this checklist prior to mailing or hand-carrying your proposal(s) to DARPA. Do not include the checklist with your proposal.

It is expected that the majority of DARPA Phase I awards will be Firm Fixed Price contracts. Phase I STTR proposals **shall not exceed $99,000**, and are for approximately one (1) year efforts. DARPA Phase II proposals must be invited by the respective Phase I technical monitor (with the exception of Fast Track Proposals - see section 4.5). Phase II STTR awards will be limited to $500,000, and it is expected that a majority of the Phase II contracts will be Firm Fixed Price-Level of Effort.

The responsibility for implementing DARPA's Small Business Technology Transfer (STTR) Program rests with the Office of Administration and Small Business (OASB). The DARPA SBIR/STTR Program Manager is Connie Jacobs. DARPA invites small businesses, in cooperation with a researcher from a university, an eligible contractor-operated federally-funded research and development center (FFRDC), or a non-profit research institution, to send proposals directly to DARPA at the following address:

DARPA/OASB/STTR
Attention: Ms. Connie Jacobs
3701 North Fairfax Drive
Arlington, VA 22203-1714

(703) 526-4170
Home Page http://www.darpa.mil

STTR proposals submitted to DARPA will be processed by DARPA OASB and distributed to the appropriate technical office for evaluation and action.

DARPA selects proposals for funding based on technical merit and the evaluation criteria contained in this solicitation document. DARPA gives evaluation criterion a., "The soundness, technical merit, and innovation of the proposed approach and its incremental progress toward topic or subtopic solution." (refer to section 4.2 Evaluation Criteria - Phase I - page 7), twice the weight of the other two evaluation criteria. As funding is limited, DARPA reserves the right to select and fund only those proposals considered to be superior in overall technical quality and highly relevant to the DARPA mission. As a result, DARPA may fund more than one proposal in a specific topic area if the technical quality of the proposal(s) is deemed superior, or it may fund no proposals in a topic area. Each proposal submitted to DARPA must have a topic number and must be responsive to only one topic.

In order to ensure an expeditious award, cost proposals will be considered to be binding for a period of 180 days from the closing date of this solicitation. For contractual purposes, proposals submitted to DARPA should include a statement of work which does not contain proprietary information. Successful offerors will be expected to begin work no later than 30 days after contract award. For planning purposes, the contract award process is normally completed within 30 to 60 days from issuance of the selection notification letter to Phase I offerors.

On a pilot basis, the DoD STTR program has implemented a streamlined Fast Track process for STTR projects that attract matching cash from an outside investor for the Phase II STTR effort, as well as for the interim effort between Phases I and II. Refer to Section 4.5 for Fast Track instructions. DARPA encourages Fast Track Applications to be submitted during the last two months of the Phase I effort. Technical dialogue with DARPA Program Managers is encouraged to ensure research continuity during the interim period and Phase II. If a Phase II contract is awarded under the Fast Track program, the amount of the interim funding will be deducted from the Phase II award amount. It is expected that interim funding will not exceed $40,000.

DARPA FY 1999 Phase I STTR
Checklist

1) Proposal Format

   a. Cover Sheet - Appendix A (identify topic number) ______

   b. Project Summary - Appendix B ______

   c. Identification and Significance of Problem or Opportunity ______

   d. Phase I Technical Objectives ______

   e. Phase I Work Plan ______

   f. Related Work ______

   g. Relationship with Future Research and/or Development ______

   h. Potential Post Applications ______

   i. Key Personnel ______

   j. Facilities/Equipment ______

   k. Subcontractors/Consultants ______

   l. Prior, Current, or Pending Support of Similar Proposals or Award ______

   m. Cost Proposal (see Appendix C of this Solicitation) ______

   n. Company Commercialization Report (see Appendix E of this Solicitation) ______

   o. Agreement between the Small Business and Research Institution (upon Contract Award) ______

2) Bindings

   a. Staple proposals in upper left-hand corner. ______

   b. **<u>Do not</u>** use a cover. ______

   c. **<u>Do not</u>** use special bindings. ______

3) Page Limitation

   a. Total for each proposal is 25 pages inclusive of cost proposal and resumes. ______

4) Submission Requirement for Each Proposal

   a. Original proposal, including signed Appendices A, B and E. ______

   b. Four photocopies of original proposal, including signed Appendices A, B and E. ______

INDEX OF DARPA FY 1999 STTR TOPICS

SUBJECT/WORD INDEX TO THE DARPA FY 1999 STTR TOPICS

Subject/Keyword | Topic Number

DARPA ST99-001 TITLE: MEMS-Based Optical Encoders for PositionalControl Systems in Conventional Missiles

KEY TECHNOLOGY AREA: Sensors and Electronic Combat

OBJECTIVE: Improve resolution over existing Hall sensor technology for brushless motor commutation and provide position feedback on actuators in missile systems using optical MEMS technology.

DESCRIPTION: An encoder can be used to sense position of a brushless motor rotor for commutation or to provide positional feedback for closed loop position control of a missile control surface actuator. Commercial applications of encoder technology include mining, petroleum drilling, automotive production, or any other automated process requiring precise tool positioning. Existing missile control surface actuators use potentiometers or Hall sensors for position sensing. Potentiometers provide a continuous voltage output proportional to actuator position. In most applications the potentiometer's analog signal is converted to a digital signal before being used by the actuator controller. This analog-to-digital conversion requires additional electronics. In a brushless motor actuator Hall sensors are typically provided as an integral part of the brushless motor assembly. The Hall sensors provide a digital output every 20° to 30° of motor rotor rotation that is used for the motor commutation logic. In some applications the Hall sensors are used as position feedback for closed loop control of the actuator output. Since the Hall sensor output is digital, the need for an analog-to-digital conversion is eliminated. For a high gear ratio actuator the course resolution of the Hall sensor output has proven to be adequate. However, for low gear ratio actuators the resolution provided by Hall sensors is inadequate for position feedback. Optical encoders have been demonstrated to offer better resolution than Hall sensors. However, these demonstrated encoders are much larger than the Hall sensor assemblies used in brushless motor and conventional potentiometers. MicroElectroMechanical Systems (MEMS) technology offers the opportunity to compact the design of existing optical encoders to fit in the space normally occupied by potentiometers or Hall sensor technology. The goal of this task is to design and develop optical encoders based on MEMS technology for improved resolution over existing Hall sensors technology while significantly reducing the size of such encoders. It is also desired to design and develop MEMS optical encoders that will provide performance comparable to a potentiometer, with a significant reduction in package size.

PHASE I: Design and demonstrate proof of principle of a MEMS-based optical encoder. The size of this encoder should be as small as or even smaller than existing Hall sensor assemblies used in brushless motors. The Hall sensor assemblies are typically 0.4 inches in diameter and approximately 0.1 inch long and are capable of sensing motor spin rates of 50,000-60,000 RPMs. The encoder should operate over a 360-degree range for commutation of motor rotor position. The encoder should operate on a supply voltage from 5 to 24 volts and provide a Transistor-Transistor Logic (TTL) compatible output signal at a resolution of 18 to 360 cycles/revolution. The encoder shall have a frequency response of 300kHz and be capable of operating between temperatures from -55°C to 150°C.

PHASE II: Validate design by fabricating prototype(s) of a MEMS-based optical encoder suitable for small missile applications, and with performance specifications at or exceeding those named above – teaming with government, industry, or academia foundries as necessary. Confirm performance through laboratory testing with interested government users for technology insertion.

PHASE III DUAL USE APPLICATIONS: Commercialization of encoder is expected. Encoder markets extend from numerous automotive and aeronautical applications requiring precise positional control including robotics, helicopter rotor control, commercial aircraft, tool control such as drilling or mining, etc. Potential market sales of small, low-cost units are astronomical.

KEYWORDS: Actuators; Control Actuation Systems, Encoder; MicroElectroMechanical Systems (MEMS)

REFERENCES:
1. U.S. Digital Corporation http://www.usdigital.com
2. Hathaway Motion Control http://opticalencoder.com
3. Encoder Products Company http://encoderprod.com
4. TR Electronic http://www.trelectronic.com
5. MicroE, Inc., 425 West Bonita, Suite 206, San Dimas, CA 91773, 909-394-1175
6. Ji-hua Zhang and Lilong Cai, "Autofocus laser rotary encoder," *Applied Optics* **37** (13), 2691-2695 (1998)

DARPA ST99-002 TITLE: High Throughput Gene Sequence Analysis of Biological Warfare (BW) Agents

KEY TECHNOLOGY AREA: Chemical and Biological Defense

OBJECTIVE: Sensitive and specific rapid-detection assays that distinguish target pathogens from environmentally ubiquitous near-neighbors, surrogates, or obscurants in complex and unpredictable environments are not available for many BW agents and surrogates. The development of high-throughput genomic technologies may have the potential to close this formidable disparity and further contribute to the development of approaches for the treatment of unconventional pathogens.

DESCRIPTION: Comprehensive analysis of the taxonomic landscape containing BW agents, surrogates, obscurants, and their environmentally ubiquitous near-neighbors has received comparatively little attention. Gene and protein targets traditionally employed for molecular phylogeny and medical diagnostics (ribosomal rRNA, ribosomal proteins, and nucleic acid metabolism genes) are highly conserved across closely related but ecologically distinct species (near-neighbors). To make fine-grained discriminations among near-neighbors requires the identification of the sequence features that distinguish one species from another. Ecological theory predicts that specific protein-coding genes can have the appropriate resolving power to define individual species. This solicitation seeks to exploit high throughput (production) sequencing of BW agents and their phylogenetic non-pathogenic nearest neighbors; and develop innovative technologies / methodologies for sequence annotation that improve our understanding of pathogenesis. The candidate pathogens are to be selected exclusively from among the relatively short list of bacteria, viruses and rickettsia identified in reference 4. Multiple awards are anticipated, with each individual award focusing on a single pathogen. To avoid unnecessary duplication of efforts, each offering team is asked to identify 4-5 pathogens of potential interest (and their corresponding non-pathogenic nearest neighbors) from which the sponsor can then select 1 prior to Phase 1 award.

PHASE I: Establish genomic libraries for target BW pathogen(s) and appropriate nearest neighbor(s); initiate sequence analysis.

PHASE II: Complete sequence analysis and annotation of BW pathogen(s); demonstrate methodology for distinguishing between target pathogen(s) and nearest neighbor(s).

PHASE III DUAL USE APPLICATIONS: Enhanced capability for diagnosis and treatment of broad range of infectious diseases.

KEYWORDS: Annotation, Gene Sequencing, Pathogens

REFERENCES:
1. Brent R, Finley RL Jr 1997 Understanding gene and allele function with two-hybrid methods. **Annu. Rev. Genet.** 31:663-704.
2. Gaasterland T. 1998. Structural genomics: bioinformatics in the driver's seat. **Nat. Biotechnol**.16:625-7.
3. Palys T, Nakamura LK, Cohan FM (1997*)* Discovery and classification of ecological diversity in the bacterial world: the role of DNA sequence data **Int. J. Syst. Bacteriol.** 47:1145-56.
4. http://www.darpa.mil/DSO/rd/Abmt/Bwd.html

DARPA ST99-003 TITLE: Innovative Hybrid Actuation Systems

KEY TECHNOLOGY AREA: Aerospace Propulsion and Power, Air Vehicles/Space Vehicles

OBJECTIVES: To develop rotary and linear hybrid actuation systems that exhibit high stroke capabilities and operate in the mid-frequency range. The goal is to use the work-generating capabilities of existing smart material transducers (primarily high frequency, short stroke) in conjunction with innovative device design concepts to develop actuation systems capable of delivering work at high strokes over relatively low frequency bands.

DESCRIPTION: The removal of hydraulic systems from aircraft and launch vehicles is desirable to achieve an all-electric vehicle. In particular, the removal of centralized hydraulic pumps, distributed pressure and return lines, valves for distribution, and accumulators would reduce flight vehicle control system complexity, size, and weight and would improve overall control system and vehicle reliability. Active elements such as piezoceramics are efficient energy transducers when driven at resonance. These materials are capable of delivering high frequency motion, thousands of cycles per second, but with very short strokes, on the order of 10-100s of microns. Shape memory alloys are capable of delivering very large strokes and forces but only over very low frequencies, a few Hz at best. For flight control systems, the work produced by smart material transducers would need to be transformed in some manner to achieve the desired output characteristics: displacements on the order of 0.5 to 10 cm at frequencies ranging from 20-50 Hz, force levels ranging from 1 to 5000 N, and torques ranging from

0.1 to 1000 N-m. Transmission of actuation forces could be achieved via direct mechanical amplification or through a combined hybrid scheme, e.g., fluid/mechanical amplification. Proposed systems should also be ranged from 30 to 3000 cubic centimeters in size. Innovative mechanical drivers that utilize direct mechanical interfaces would be preferable to Coulombic friction drives.

PHASE I: The objectives in the first phase of the work will be to design and construct critical elements of a hybrid actuation system to prove the basis of the operational approach. Deliverables should include a design for all mechanical and/or fluidic elements, as well as preliminary design concepts for the important electrical subsystems.

PHASE II: In the second phase of the work, a pre-production prototype, suitable for testing in various flight vehicle demonstrations, should be fabricated. Concurrent design of the electronics will need to be performed to maximize the system performance and efficiency. This prototype should be self-contained, requiring only power and a command signal for operation. Overall energy consumption should be at levels comparable to or less than that for other flight control actuators.

PHASE III DUAL USE APPLICATIONS: *In situ* flight control experiments should be sought to demonstrate the hybrid actuator in both commercial aviation systems and/or launch vehicle controllers. Other, non-aerospace, applications in controls and automation (e.g., industrial controls, robotics, and automotive) should be explored. Reasonable production costs, system manufacturability, and a compelling plan for commercialization are critical factors in determining further support for this effort.

KEYWORDS: Actuators, Hydraulics, Mechanics, Smart Materials, Transmission

DARPA ST99-004 TITLE: <u>Virtual Assembly of Microsystems</u>

KEY TECHNOLOGY AREA: Materials, Processes and Structures; Manufacturing Science and Technology

OBJECTIVE: Develop a virtual reality (VR) environment that supports the evaluation of key requirements for the construction and assembly of nano to millimeter sized systems, with the overall goal of designing systems that are producible and affordable.

DESCRIPTION: Successful development of prototype nano to millimeter sized devices are driving the need to develop the associated precision assembly and manufacturing processes required to produce them. Although many single process technologies have been successful in fabricating components outside their specialty (mechanical versus electrical) constraints specific to the process prevent widespread use and acceptance. To enable more effective and efficient systems, three dimensional systems consisting of tightly integrated nano through millimeter sized components/subsystems fabricated by multiple processes (e.g., electronic lithography, solid freeform fabrication, injection molding, etc.) will be required. In response to this requirement, new assembly and manufacturing technologies that address issues and barriers seen at this small scale need to be developed and matured. One such technology, virtual reality environments, support designers in recognizing issues in assembly processes that normally would only be discovered late in the product design stage during initial pre-production activities. This results in increasing production costs, delaying system deployment, and potentially, compromising continuing development of the system. Key considerations in the construction of this environment are the capability to support physics-based models of assemblies that simulate the critical forces and transitions between these forces. In this realm attention shifts from traditional gravitational forces to van der Waals, electrostatic, electro-magnetic, etc. forces. The environment should enable the development of objects that carry with them information and knowledge that supports construction of the initial environment and rapid insertion of new objects into the assembly model. These objects would carry with them knowledge that would be utilized to identify and execute appropriate equation sets depending on the environment they interact it. Further, appropriate feedback for more effective evaluation of the manufacturing process should be provided through immersive activated devices, augmented devices, or a combination of both.

PHASE I: Develop an understanding of the key factors confronting the deployment of VR simulation and modeling systems for integrated product and process design (IPPD). Create a proof-of-concept application to demonstrate the usefulness of these methods in planning and performing micro and nano 3D assemblies. Some areas of interest include (but are not limited to): 1) investigate the use of virtual assembly to plan and evaluate the assembly planning of micro-scale three-dimensional assemblies; 2) investigate scaleable physically-based modeling techniques to model and display the forces involved; 3) identify the physics and materials models that apply to these interactions and investigate their applicability in a virtual reality based assembly system; 4) investigate the use of haptic feedback devices to "display" real and scaled forces to the assembly planner; and 5) investigate the modeling of specialized tools which may be required for this scale of 3D assemblies.

PHASE II: Complete the specification (documented in UML) of the virtual reality based design environment architecture and the functionality that will be implemented to address the key factors determined in Phase 1 effort. Develop a prototype of the virtual reality based design environment that supports the inclusion of physics-based models and appropriate feedback to the designer enabling better understanding of key factors relating to the system design.

PHASE III DUAL USE APPLICATIONS: This will provide a powerful tool to evaluate producability and affordability during concept development. It will have applications in all system development efforts as well as advancing the technology for other sciences where it is essential to construct physics-based models and utilize immersive user interaction. Some defense and commercial markets that can benefit from the technologies include the fabrication and assembly of integrated sensors and sensor fusing subsystems, controls and actuators, electronic-to-mechanical component integration, computer peripherals, and medical-surgical devices.

KEYWORDS: Affordability, Microsystems, Nanosystems, Physics-Based Models, Virtual Assembly

REFERENCES:
1. J. Feddema, R. Simon, "CAD-Driven Microassembly and Visual Servoing," *Proc. of IEEE, International Conference on Robotics and Automation*, Belgium, May 1998
2. R. Arai, D. Ando, T. Fukana, Y. Nonoda, T. Oota, "Micro Manipulation Based on Micro Physics - Strategy Based on Attractive Force Reduction and Stress Measurement, " *Proc. of ICRA 1995*, pp. 236-241
3. A. Shulzmann, H.M. Breguett, J. Jacot, "Microvision system (MVS): a 3D Computer Graphic-Based Microrobot telemanipulation and Position Feedback by Vision, " *Proc. of SPIE Vol. 2593*, Philadelphia, PA Oct. 25, 1995
4. T. Lozanno-Perez, M. Mason, R. Taylor, "Automatic Synthesis of Fine-Motion Strategies for Robots," *Journal of Robotics Research, Vol. 3, No. 1, Spring 1984*

DARPA ST99-005 TITLE: Computing Platform Coverage Via Light Host Based Intrusion Detection

KEY TECHNOLOGY AREA: Computing and Software

OBJECTIVE: Demonstrate that light host based intrusion detection sensors employed throughout a system including all critical applications provide reliable intrusion detection coverage for an entire platform. Demonstrate performance advantages of the resulting aggregate system over current host-based systems.

DESCRIPTION: Most of today's commercial intrusion detection technology relies on single-point network sniffer models. Because of evolving network and encryption technologies, catching intrusions by monitoring network traffic is quickly becoming an unworkable approach, making use of host-based intrusion detection sensors increasingly important. To date, most research on host-based sensors has concentrated on searching monolithic audit files for either signatures consistent with known attacks or for signs of anomalous behavior. Both of these approaches require high Central Processing Unit (CPU) usage, and have performance limitations. Recently, new approaches to host-based intrusion detection have been proposed which monitor the behavior of specific critical programs to determine if they are performing within the boundaries of specified operations, and flagging excursions from those specifications as potential attacks. Similar approaches use clustering algorithms to specify normal behavior. These approaches in theory do not need prior knowledge of an attack signature. While some early results seem promising, the techniques have not been extended to offer reliable coverage of an entire platform.

PHASE I: Pick an operating system of interest to the military (preferably, Windows NT, Solaris, or potentially Linux), and identify all critical applications that should be monitored by an intrusion detection system. Determine the best strategy for defending the platform and develop proof-of-concept sensors for a handful of these applications to demonstrate the effectiveness of your approach.

PHASE II: Extend the approach demonstrated in Phase I to the rest of the critical applications identified. The result of this phase should be a host-based system which provides reasonably good intrusion detection coverage of one operating system.

PHASE III DUAL USE APPLICATIONS: This new generation of intrusion detection systems would have increased reliability and decreased performance drain. Since sensors and strategies developed under this effort should easily integrate into existing commercial platforms, the technology easily transfers to platform developers, vendors, and third parties interested in selling after market security enhancements providing superior protection and improved performance over existing intrusion detection technology.

KEYWORDS: Anomaly Detection, Computational Immunology, Computer Intrusion Detection, Computer Security, High Assurance Computing, Host Based Intrusion Detection, Information Assurance, Information Survivability, Intrusion Detection, Lightweight, Meta-learning Agents, Network Intrusion Detection, Reliability, Security, Specification Based Intrusion Detection

REFERENCES:
1. C.C.W. Ko , "Execution Monitoring of Security-Critical Programs in a Distributed System: A Specification-Based Approach", August 1996. http://seclab.cs.ucdavis.edu/papers/ko96-phd-thesis.ps

2. “A sense of self for Unix processes” S. Forrest, S. A. Hofmeyr, A.
Somayaji, and T. A. Longstaff. In Proceedings of 1996 IEEE Symposium on Computer Security and Privacy (1996). http://www.cs.unm.edu/~steveah/publications/ieee-sp-96-unix.pdf
3. W. Lee and S. Stolfo (1997), Data Mining Approaches for Intrusion Detection, Proceedings 1998 7th USENIX Security Symposium. http://www.cs.columbia.edu/~sal/hpapers/USENIX/usenix.html
4. Crispan Cowan, et al., “StackGuard: Automatic Adaptive Detection and Prevention of Buffer-Overflow Attacks,” Proceedings 1998 7th USENIX Security Symposium. http://www.usenix.org/publications/library/proceedings/sec98/cowan.html

DARPA ST99-006 TITLE: Novel Host-Based Intrusion Indicators for Agent-Based Detectors

KEY TECHNOLOGY AREA: : Computing and Software

OBJECTIVE: Develop novel host-based intrusion indicators and sensors that could be used by lightweight intrusion detection agents.

DESCRIPTION: Several projects in recent years have proposed architectures in which lightweight mobile agents could be deployed and managed for intrusion detection. Unfortunately, there has been less work in determining what sensors these agents might use to reliably detect intrusions. Lightweight agents could be potentially used without incurring the heavy Central Processing Unit (CPU) and disk usage penalties associated with full auditing. However, since agents do not individually have a global view of the system collections of lightweight agents do not necessarily provide coverage necessary to reliably detect attacks. Ideally, for any class of attacks one could use a combination of resident applications in conjunction with novel sensors that target only the information required to detect that particular class, or dynamically enable more focused sensors to increase reliability while minimizing performance drain.

PHASE I: Design a strategy for using host-based indicators and sensors to protect an operating system of interest to the military (Windows NT, Solaris, Linux, or FreeBSD) against broad classes of attacks. Identify sensors that need to be developed in Phase II to provide complete and reliable intrusion detection. Identify a rule-base or reasoning engine for intelligently deploying the sensors. Identify an agent-based framework or other architecture for dynamic deployment and management of sensors. Propose designs for the sensors.

PHASE II: Develop sensors identified in Phase I and integrate them into the simple agent structure. Demonstrate effectiveness of the proposed approach in detecting classes of attacks identified.

PHASE III DUAL USE APPLICATIONS: This new generation of intrusion detection systems would have dramatically increased reliability, decreased performance drain, and reactive capabilities for better adapting to their dynamic environment.

KEYWORDS: Agent Based Intrusion Detection, Anomaly Detection, Computational Immunology, Computer Intrusion Detection, Computer Security, High Assurance Computing, Host Based Intrusion Detection, Information Assurance, Information Survivability, Intrusion Detection, Lightweight, Meta-Learning Agents, Mobile Code, Network Intrusion Detection, Reliability, Security, Specification Based Intrusion Detection

REFERENCES:
1. “An Architecture for Intrusion Detection using Autonomous Agents,” Jai Balasubramaniyan, Jose Omar Garcia-Fernandez, E. H. Spafford, and Diego Zamboni, Department of Computer Sciences, Purdue University; Coast TR 98-05; 1998 http://www.cs.purdue.edu/homes/spaf/tech-reps/9508.ps
2. C.C. W. Ko , “Execution Monitoring of Security-Critical Programs in a Distributed System: A Specification-Based Approach”, August 1996. http://seclab.cs.ucdavis.edu/papers/ko96-phd-thesis.ps
3. “A sense of self for Unix processes” S. Forrest, S. A. Hofmeyr, A. Somayaji, and T. A. Longstaff. In Proceedings of 1996 IEEE Symposium on Computer Security and Privacy (1996). http://www.cs.unm.edu/~steveah/publications/ieee-sp-96-unix.pdf
4. W. Lee and S. Stolfo (1997), Data Mining Approaches for Intrusion Detection, Proceedings 1998 7th USENIX Security Symposium. http://www.cs.columbia.edu/~sal/hpapers/USENIX/usenix.html

DARPA ST99-007 TITLE: Video Detection, Tracking and Classification of Vehicles, Humans and Animals in Outdoor Environments

KEY TECHNOLOGY AREA: Computing and Software

OBJECTIVE: The objective is to insert advanced image understanding (IU) technology for detection, tracking and classification of vehicles, humans and animals in outdoor environments into commercial video surveillance and monitoring systems.

DESCRIPTION: The objective is to insert advanced image understanding (IU) technology for detection, tracking and classification of vehicles, humans and animals in outdoor environments into commercial video surveillance and monitoring systems. Specific goals include: (a) to insert IU components for adaptive background characterization, motion detection, object tracking and/or object classification via appropriate Application Program Interfaces (APIs); (b) to integrate three-dimensional (3D) site models via appropriate APIs; (c) to develop capabilities to manage multiple terrestrial sensors and multiple objects within a three-dimensional geodetic coordinate system; (d) to develop capabilities for remote management of the video surveillance and monitoring system including graphical visualization; and (e) to engineer processes to characterize the performance of IU components inserted into the commercial system.

PHASE I: Refine concepts for integration of image understanding components to meet system objectives. Specify targeted commercial and military applications. Identify critical design issues, specify targeted commercial system and appropriate APIs, and conduct experiments to establish feasibility. Deliver a specification, development plan, testing plan and cost estimate for the prototype system.

PHASE II: Implement the system and APIs as designed. Demonstrate system performance in accordance with testing plan. Evaluate operating characteristics of the implemented system. Prepare marketing plan for targeted commercial and military applications.

PHASE III DUAL USE APPLICATIONS: Potential Phase III dual use applications lie in both defense and civilian applications for security surveillance and monitoring.

KEYWORDS: Computer Vision; Image Understanding; Motion Detection; Object Tracking; Video Image Processing; Video Surveillance

REFERENCES:

1. DARPA Image Understanding Program Home Page (http://www.darpa.mil/iso/iu/)
2. Video Surveillance and Monitoring Home Page (http://www.cs.cmu.edu/~vsam/vsamhome.html)

DARPA ST99-008 TITLE: Integration of Real-time, Real-World Data in Dynamic Synthetic Environments in Advanced Distributed Simulation

KEY TECHNOLOGY AREA: Computing and Software; Modeling and Simulation

OBJECTIVE: The objective is to integrate real-time meteorological sensors and computer vision processes with Advanced Distributed Simulation technology to populate, and display shared four-dimensional digital models of geospecific areas with dynamic representations of actual weather, vehicular, human and animal activities.

DESCRIPTION: The objective is to integrate real-time meteorological sensors and computer vision processes with Advanced Distributed Simulation technology to populate, and display shared four-dimensional digital models of geospecific areas with dynamic representations of actual weather, vehicular, human and animal activities. Specific goals include development of: (a) an Application Program Interface (API) to ingest complex Synthetic Environments including integrated Triangular Irregular Networks (iTIN) and meteorological data from the Synthetic Environments Data Representation and Interchange Specification (SEDRIS); (b) APIs and processes to maintain and display dynamic states of terrain and environment consistent with Modular Semi-Automated Forces (MODSAF) as implemented for the Synthetic Theater of War (STOW) under the the USD(A&T) mandated High Level Architecture (HLA); and (c) real-time interfaces to computer vision processes to characterize vehicular, human and animal activities.

PHASE I: Refine concepts for integration of synthetic environments, meteorological and computer vision components to meet system objectives. Specify targeted commercial and military applications. Identify critical design issues, specify APIs and conduct experiments to establish feasibility. Deliver a specification, development plan, testing plan and cost estimate for the prototype system.

PHASE II: Implement the system as designed. Demonstrate system performance in accordance with testing plan. Evaluate operating characteristics of the implemented system. Prepare marketing plan for targeted commercial and military applications.

PHASE III DUAL USE APPLICATIONS: Potential Phase III dual use applications lie in defense and civilian applications for training, analysis, acquisition and surveillance.

KEYWORDS: Advanced Distributed Simulation, Computer Generated Forces, Human Modeling, Image Understanding, Live Simulation, Synthetic Environments, Virtual Simulation

REFERENCES:
1. DARPA Image Understanding Program Home Page http://www.darpa.mil/iso/iu/
2. Synthetic Theater of War Home Page http://stow98.spawar.navy.mil
3. Synthetic Environments Home Page http://svl.tec.army.mil/SE/)
4. ModSAF Home Page http://www.modsaf.org/
5. SEDRIS Home Page http://www.sedris.org/
6. Joint Simulation System (JSIMS) Home Page http://www.jsims.mil
7. DoD High Level (Simulation) Architecture http://hla.dmso.mil/hla/